INGUINAL HERNIA REPAIR – A COMPARATIVE STUDY BETWEEN INGUINAL FIELD BLOCK AND GENERAL ANAESTHESIA

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CERTIFICATE

This is to certify that the dissertation entitled, **"INGUINAL HERNIA REPAIR – A COMPARATIVE STUDY BETWEEN INGUINAL FIELD BLOCK AND GENERAL ANAESTHESIA"** SUBMITTED BY Dr. R. Umesh, in partial fulfillment for the award of the degree of Doctor of Medicine in Anaesthesiology by the Tamilnadu Dr.M.G.R. Medical University, Chennai is a bonafide record of the work done by him in the Department of Anaesthesiology, Madras Medical College, during the academic year 2006 -2009.

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CONTENTS

INTRODUCTION

Inguinal hernia is a very common problem in the general population with a very high incidence. In fact, inguinal hernia is most common type of hernia. As a result of this high incidence, inguinal herniorraphy or hernioplasty is a commonly performed procedure. Hence, the plan of anaesthesia becomes very important. Most of the cases are done as a day-care procedure or with just one day of in-hospital stay and ideally, the plan of anaesthesia should be with the aim of quicker recovery, minimum side effects, maximum pain relief and good patient satisfaction. So, towards this end, a comparative study was done between local anaesthesia and general anaesthesia.

AIM OF THE STUDY

The aim of this study is to compare the differences between local and general anaesthesia for inguinal hernia repair by comparing intra-op hemodynamic parameters, recovery profiles, post-op pain relief, post-op pain satisfaction, and post-op side effects.

ANATOMY OF THE INGUINAL REGION

An inguinal hernia is the protrusion of part of the contents of the abdomen through the inguinal region of the abdominal wall. The inguinal region is a weak part of the abdominal wall due to the presence of the inguinal canal, the deep inguinal ring and the superficial inguinal ring.

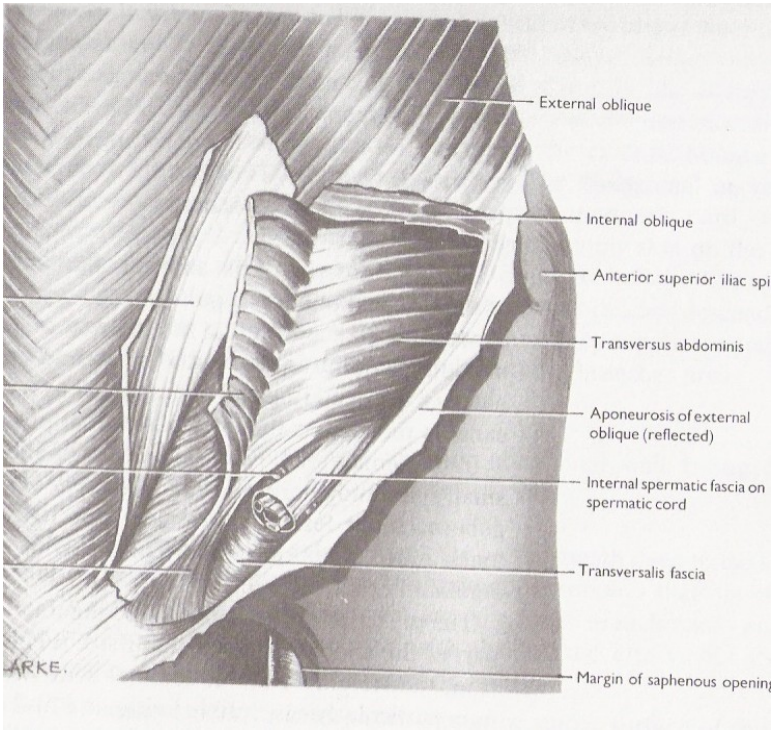
The inguinal canal - The inguinal canal is a triangular slit almost horizontal in direction which lies just above the inner half of the inguinal ligament. It commences at the deep inguinal ring and ends at the superficial inguinal ring. In infants, the superficial and deep inguinal rings are almost superimposed and the obliquity of this canal is slight. In adults, the inguinal canal is about 3.75 cm long and is directed downwards and medially from the deep to the superficial inguinal ring. This canal develops due to the descent of testis in the embryonic life.

The deep inguinal ring - It is an opening in the fascia transversalis 1.25 cm above the mid-inguinal point, i.e., midpoint between the symphysis pubis and the anterior superior iliac spine. It is oval in shape, the long axis being vertical. It varies in size in different individuals and is much larger in the male than in the female. At its margins, the fascia transversalis is condensed. Medially, it is related to the inferior epigastric vessels. It

transmits the spermatic cord in the male and round ligament of the uterus in the female.

The superficial inguinal ring - It is an interval in the aponeurosis of the external oblique muscle. It is situated just above and lateral to the crest of the pubis. The aperture is somewhat triangular with its long axis corresponding to the course of the fibres of the aponeurosis. Its base is formed by the crest of the pubis and its sides by the margins of the opening of the aponeurosis which are called the crura of the ring. The superficial inguinal ring gives passage to the spermatic cord and the ilio-inguinal nerve in the male and to the round ligament of the uterus and the ilio-inguinal nerve in case of females.

Exposure of the inguinal region



Boundaries of the inguinal canal

Anteriorly - throughout its whole length there are skin, the superficial fascia and the aponeurosis of the external oblique and in its lateral 1/3rd there are the fleshy fibres of the origin of the internal oblique.

Posteriorly - the transversalis fascia along the whole length of the canal separates it from the extraperitoneal connective tissue and the peritoneum. In the medial half there is the conjoined tendon (combination of internal oblique and transverses muscles) and reflected part of the inguinal ligament.

Above - there are arched fibres of the internal oblique and transverses abdominis before they fuse to form the conjoined tendon.

Below - the floor is formed by the grooved upper surface of the inguinal ligament and its union with fascia transversalis. At its medial end there is lacunar ligament.

Contents of the inguinal canal

★ Ilio-inguinal nerve which enters the inguinal canal in its medial half by piercing the internal oblique muscle and lies below the spermatic cord to accompany it through the superficial inguinal ring.

★ In males, spermatic cord and its coverings, internal spermatic fascia, cremasteric fascia and external spermatic fascia.

★ In females, round ligament of uterus.

Structures of the spermatic cord

★ Vas deferens

★ Arteries of the spermatic cord – testicular artery, artery of the vas deferens and artery to the cremaster

★ Pampiniform plexus of testicular veins

★ Lymph vessels of the testis

★ Nerves – testicular plexus of sympathetic nerves which accompany the testicular artery and artery of the ductus deferens and the genital branch of the genitofemoral nerve

ANATOMY OF THE NERVES IN THE INGUINAL REGION

Innervation of inguinal region is by 11^{th} and 12^{th} thoracic nerves and 1^{st} and 2^{nd} lumbar somatic nerves -

- Ilioinguinal nerve (L1)
- Iliohypogastric nerve (T12,L1)
- Genitofemoral nerve (L1,L2)

Some fibres from T11 above and some fibres crossing the midline.

Innervation of the spermatic cord -

- Genital branch of genitofemoral nerve and testicular plexus of sympathetic nerves from thoracic sympathetic outflow.

Formation of the lumbar plexus

The plexus assembles in front of the transverse processes of the lumbar vertebrae within the substance of the psoas major. L1, joined in 50% of cases by a branch from T12, divides into an upper and lower division. The upper division gives rise to the iliohypogastric and ilioinguinal nerves; the lower joins a branch from L2 to form the genitofemoral nerve. The rest of L2, together with L3 and the contribution to the plexus from L4, divide into dorsal and ventral divisions. Dorsal divisions L2 and L3 from the lateral cutaneous nerve of the thigh and L2,L3,L4 form the femoral nerve. The ventral branches join to form the obturator nerve (L2,L3,L4) and when present accessory obturator nerve (L3,L4).

Course of the ilioinguinal, iliohypogastric, genitofemoral nerves

Ilioinguinal nerve -

It emerges at the lateral border of the psoas, runs downwards and laterally in front of the quadratus lumborum, and behind the kidney and colon, pierces the transverses abdominis a little above the iliac crest, and runs in the abdominal wall. It pierces the internal oblique just below and medial to the iliohypogastric nerve, runs with the spermatic cord or with the

round ligament of the uterus, and becomes cutaneous by emerging through the superficial inguinal ring.

Iliohypogastric nerve -

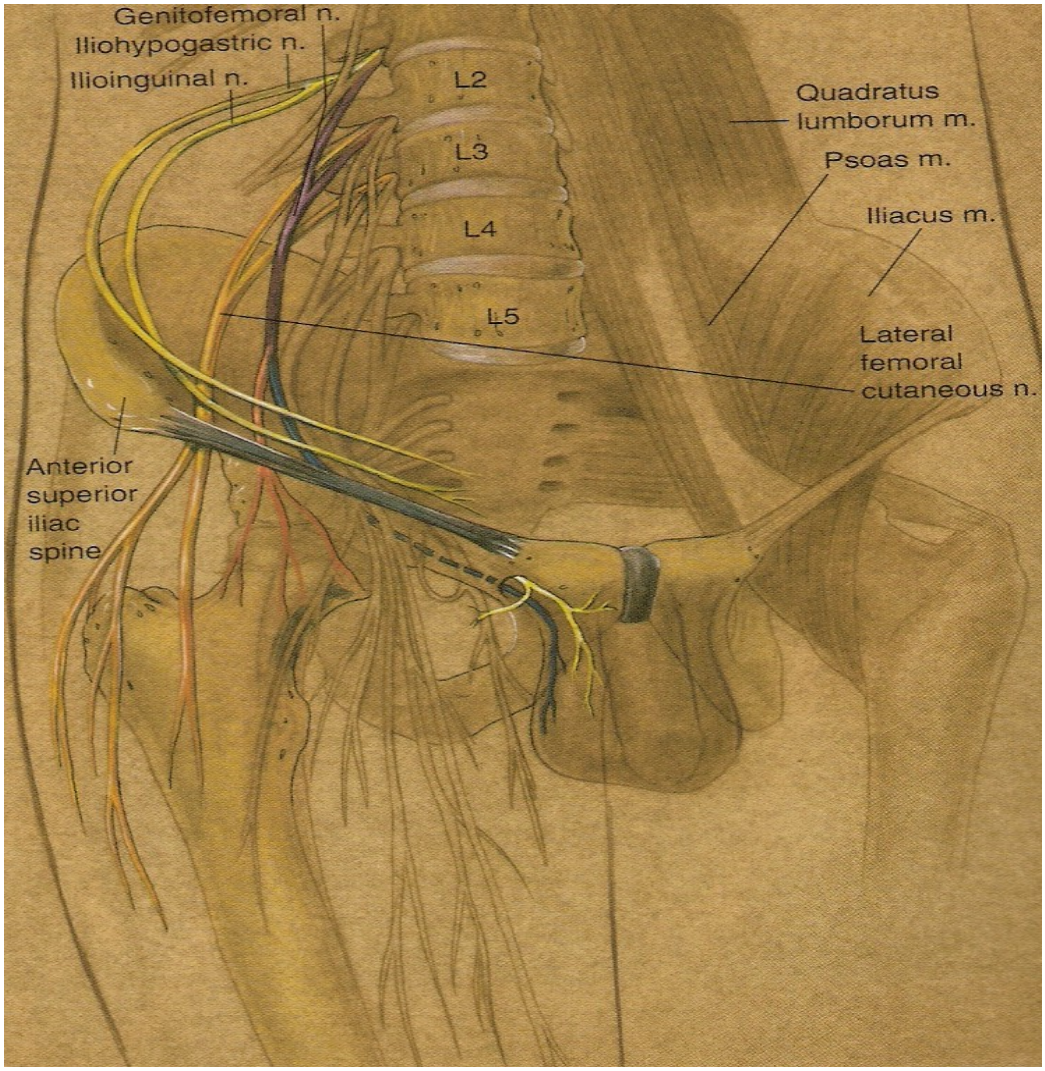
It has a similar course as the ilioinguinal nerve except it is a higher level. The iliohypogastric nerve pierces the internal oblique from deep to superficial surface about 2.5 cm in front of the anterior superior iliac spine. It becomes cutaneous by piercing the external oblique aponeurosis about 2.5 cm above the superficial inguinal ring. Its lateral cutaneous branch supplies the gluteal region.

Genitofemoral nerve -

It emerges on the anterior surface of the psoas muscle near its medial border and runs downwards in front of the muscle. Near the deep inguinal ring, it lies in front of the external iliac artery and divides into femoral and genital branches. The femoral branch passes through the arterial compartment of the femoral sheath and is distributed to the skin of the upper part of the front of the thigh. The genital branch pierces the psoas sheath and enters the inguinal canal through the deep inguinal ring. In the male, it

supplies the cremaster muscle, and in the female, it gives sensory branches to the round ligament of the uterus and to the skin of the labium majus.

Course of the ilioinguinal, iliohypogastric and genitofemoral nerves



PHARMACOLOGY

LIGNOCAINE

Amide local anaesthetic which works rapidly and reliably. It was synthesized by Lofgren in 1943. Its chemical structure is 2, 6 aceto xylidide hydrochloride.

Physiochemical properties -

★ Molecular weight - 234

★ pKa - 7.9

★ Partition Coefficient - 2.9

★ Binds to alpha – 1 acid glycoprotein - 64 %

Pharmacokinetics -

Lignocaine is metabolized in liver by microsomal enzymes. N – dealkylation of the tertiary amine takes place and hydroxylation of aromatic nucleus occurs. Lignocaine is broken down to xylidide and diethyl

aminoacetic acid. Excreted in urine as xylidide and 5 % unchanged form. At body pH of 7.4, lignocaine with pKa 7.9, 25 % exists in non – ionized state. Peak plasma concentration is achieved within 15 – 20 mins. Volume of distribution is 9 litres. It has medium potency, rapid onset of action, good penetrance and medium duration of action. If epinephrine 5 micrograms/ml is added, it prolongs the duration and reduces the toxicity.

Pharmacodynamics -

- ★ CVS - Lignocaine binds to cardiac sodium channels and causes inhibition of conduction and it comes out of it quickly. In low doses, it is used to treat ventricular arrhythmias. It increases pulmonary artery pressure and has a negative inotropic effect. May cause bradyarrhythmias in high doses.

- ★ CNS - Stabilizes the cell membrane. So, used in treating grand mal seizures.

- ★ Smooth muscle - It is stimulating at low concentrations and inhibitory at high concentrations.

- ★ Anti – inflammatory property - It inhibits prostaglandins synthesis and migration granulocytes.

Mode of action -

Lignocaine prevents transmission of nerve impulses by inhibiting passage of sodium ions through ion selective sodium channels in nerve membrane.

Uses -

★ For alteration of stress response to intubation

★ Suppression of grand mal seizures

★ Analgesia

★ Treatment of ventricular dysrrhythmias

Systemic toxicity -

★ The ratio of dosage required for irreversible cardiovascular collapse and the dosage that produces CNS toxicity, i.e., CVS/CNS ratio is lower for lignocaine - 7:1.

★ Neurotoxicity - Transient radicular irritation

BUPIVACAINE

Amide local anaesthetic which is available as racemic mixture of the enantiomers. It was introduced in 1957. Its chemical structure is N – Butyl pipecolic 2,6 dimethyl xylidide hydrochloride.

Physiochemical properties -

★ Molecular weight 288

★ pKa 8.1

★ Partition coefficient 27.5

★ Protein binding 96 %

Pharmacokinetics -

★ Absorption - Depends on the site of injections and presence of vasoconstrictors.

★ Distribution - Highly perfused organs (brain, heart, lung) are responsible for initial uptake, followed by slower redistribution to

moderately perfused tissues. Depends on tissue blood partition coefficient. High lipid solubility facilitates tissue uptake.

★ Metabolism and Excretion - Metabolised by microsomal enzymes of liver by amine hydrolysis and conjugation and aromatic hydroxylation. So, metabolism is affected by hepatic disorders.

Pharmacodynamics -

★ CVS - Hypotension, AV block, dysrrhythmias. It causes more pronounced depolarization than lignocaine and blocks cardiac sodium channels and alters mitochondrial function, it goes in fast but comes out slow, so highly cardiotoxic. Resuscitation is prolonged and difficult.

★ RS - Relaxes smooth muscles of bronchioles

★ Musculoskeletal - If the drug is directly injected into the muscle, the drug is myotoxic.

★ CNS - At toxic doses, it can cause tinnitus, blurred vision, restlessness, agitation, blurred speech, drowsiness and coma.

★ Hematological - It enhances fibrinolysis.

Mode of action -

Bupivacaine acts by binding to voltage gated sodium channels, prevents opening of channels by inhibiting conformational changes that underlie channel activation.

Onset and Duration of Action -

Slow and prolonged duration. Duration of action also depends on the dose and concentration of drug injected. Epinephrine does not markedly prolong the duration.

GLYCOPYRROLATE

Physiochemical properties –

Glycopyrrolate is an ester linkage between an aromatic acid called mandelic acid and an organic base called tropine. Active form of this anticholinergic drug is the levorotatory form.

Pharmacokinetics –

★ Onset of action - 2 to 3 minutes

★ Duration of action - 2 to 4 hours

★ Elimination - 80 % is excreted unchanged in the urine

Pharmacodynamics -

★ Anti-sialagogue – More potent than atropine, but slightly less potent than scopolamine

★ CVS – Increases heart rate

★ CNS – Due to its quarternary structure, it does not penetrate the blood brain barrier and there are no CNS effects

★ Smooth Muscle – Relaxes smooth muscle

Dose –

★ Premedication – 5 to 10 micrograms/kg iv or im

FENTANYL

Physiochemical properties –

It is a synthetic opioid coming under the class of phenylpiperidine series.

Pharmacokinetics -

★ Onset of action – Within 1 to 1.5 mins. Since it is highly lipid soluble, it is rapidly eliminated from the central tissues like brain, heart and lung and get redistributed to muscle and fat within 5 mins.

★ Duration of action – Recovery from fentanyl action occurs within 60 mins. But, terminal elimination half-life is upto 3.5 to 6 hours.

★ Elimination – Clearance is primarily by rapid and extensive metabolism in the liver.

Pharmacodynamics –

★ CVS – At usually used clinical doses, remarkable hemodynamic stability. Only at very high doses, slight negative inotropic property.

When used in combination with other drugs like diazepam, fentanyl exhibited cardiovascular depression.

★ RS – Respiratory depression develops rapidly after fentanyl injection, reaching a peak within 5 minutes.

★ CNS – Reduces the MAC of volatile anaesthetics in a dose-dependent manner. There are some case reports of increased ICP and CBF. But, the reason was found to be due to decreased mean arterial pressure which led to increase in CBF AND ICP.

★ Smooth muscle – Can delay gastric emptying and significantly increases common bile duct pressure.

Dose -

1.5 to 2 mics/kg prior to induction agent like barbiturate. 0.5 to 2.5 mics/kg may be repeated every 30 mins depending upon the surgical stimulus.

PROPOFOL

Physiochemical properties –

Propofol is 2,6 – diisopropylphenol consisting of a phenol ring with two isopropyl groups attached. The preparation consists of a 1 % aqueous solution with soyabean oil, glycerol and egg lecithin.

Pharmacokinetics –

★ Onset of action – Highly lipid soluble, so onset of action is one-arm-to-brain circulation time.

★ Duration of action – Awakening from propofol is also very rapid due to a very short initial distribution half-life of about 2 to 8 mins.

★ Elimination – Exceptionally rapid clearance rates, 10 times faster than thiopental, probably accounting for the rapid recovery after a continuous infusion. Metabolites of propofol are primarily excreted in the urine.

Pharmacodynamics -

★ CVS – Decreases systemic vascular resistance, cardiac contractility and preload causing a decrease in blood pressure.

★ RS – Profound respiratory depressant that usually causes apnea on induction.

★ CNS – Reduces cerebral blood flow and intracranial pressure.

Dose –

Induction dose of 1 to 3 mg/kg. Maintenance infusion of 50 to 200 mics/kg/min.

MIDAZOLAM

Physiochemical properties –

It is a water soluble benzodiazepine with an imidazole ring in its structure that accounts for stability in aqueous solutions and rapid metabolism.

Pharmacokinetics –

★ Onset of action – 30 to 60 secs. Time to peak effect – 3 to 5 mins.

★ Duration of action – It is a much shorter acting drug than diazepam and the elimination half-life is about 1 to 4 hours

★ Elimination – Metabolised by cytochrome P-4503A4 enzymes. It undergoes hydroxylation and subsequent glucuronidation and is finally eliminated by the kidneys.

Pharmacodynamics –

★ CNS – Produces sedation, hypnosis and also has anticonvulsant properties.

★ CVS – At low doses, relatively stable even when used with opioids. At high doses, especially in the elderly can cause hypotension.

★ RS – Dose-dependent respiratory depression can occur. Transient apnea can occur with rapid iv injection of large doses of midazolam.

Dose –

1 to 2.5 mg iv as premedicant, or as sedation during regional anaesthesia.

REVIEW OF LITERATURE

Innumerable studies have been done by various workers on the type of anaesthesia for inguinal hernia repair. Dajun Song, MD, PhD et al compared the recovery profiles and costs of anaesthesia for outpatient unilateral, inguinal hernia repair and concluded that local anaesthesia with mild sedation resulted in greater patient satisfaction, lower pain scores and quicker time-to-home readiness.

A multicentre randomized trial by Nordin P et al also reiterated the fact that local anaesthesia has substantial advantages over general anaesthesia because of lesser postoperative pain and shorter requirements of hospital stay.

Similar results were reported by Aasbo V et al when comparing inguinal field block with general anaesthesia.

Subramaniam P et al conducted a study comparing inguinal hernia repair between local and general anaesthesia and concluded that the post-op parenteral opioid requirements was significantly lower in the local anaesthesia group.

A study conducted by Behnia et al found that there was no significant hemodynamic differences between local anaesthesia group and general anaesthesia group. But, the pain medication required for post-op pain relief was considerably lesser in the local group and significant cost benefits were seen in the local group because of elimination of general anaesthesia and reduction of recovery room fees.

Mark Tverskoy et al conducted a randomised, double blind study and concluded that post-operative pain was significantly decreased when inguinal hernia repair was done under local anaesthesia. The most quoted study for inguinal field block which advocates the combination of lignocaine and bupivacaine is “Local Anaesthesia for Inguinal Hernia Repair Step by Step Procedure” by Amid et al published in the Annals of Surgery in 1994. When comparing the pharmacokinetics and pharmacodynamics of lignocaine and bupivacaine, it is easy to understand the reason behind using a combination of the two when we are using it for the inguinal block. In addition, various studies have been performed to evaluate the efficacy and usefulness of combination of lignocaine and bupivacaine for peripheral nerve blocks.

MATERIALS AND METHODS

A prospective, randomized study was conducted on 40 patients coming for inguinal hernia repair. They were randomly allocated into either local anaesthesia group or general anaesthesia group by flip of a coin. Study conducted after approval of institutional ethical committee and informed consent from the patient.

Inclusion Criteria:

- ★ ASA Status I & II
- ★ Age 18 to 65 years
- ★ Weight 50 to 70 kg
- ★ Elective procedure
- ★ Unilateral, reducible inguinal hernia
- ★ Mallampati Class I and II
- ★ Mouth opening > 3 cm
- ★ Neck movements adequate

Exclusion Criteria:

- ★ Patient refusal
- ★ Active gastroesophageal reflux disease or other predisposing conditions for possible aspiration
- ★ Significant neurological, psychiatric, cardiovascular, respiratory, renal or hepatic disease
- ★ Any signs or conditions indicating anticipated difficult airway
- ★ Not fulfilling inclusion criteria

Procedure for Group L - Local Anaesthesia:

- ★ Premedication - Glycopyrrolate 0.2mg iv
  Fentanyl 2 micrograms/kg iv
- ★ 20 ml of 2%lignocaine + 20 ml of 0.5% bupivacaine with 100 micrograms adrenaline is taken

★ Midazolam titrated to Ramsay Sedation Score of 3 (max dose of 0.1 mg/kg)

★ Supplementation of local anaesthetic allowed intraoperatively by surgeon

★ Maximum dose of lignocaine with adrenaline is 500 mg Maximum dose of bupivacaine with adrenaline is 225 mg

★ **Technique** -

Skin wheals with 25 G needle at

(A) - 2 cm medial and inferior to anterior superior iliac spine

(B) - superficial inguinal ring

23 G Quincke's needle is introduced at (A) in a lateral and inward direction so as to touch the iliac crest. On its way out, the needle is moved in a fan- shaped manner for even spread in all the layers. Around 10 ml of local anaesthetic is injected in this manner. Through the same skin wheal, the needle is introduced medially, parallel to and above the inguinal ligament around the anticipated line of incision, with around 5 ml of local anaesthetic.

23 G Quincke's needle is introduced at (B) in a medial and downward direction so as to touch the pubic symphysis. Around 5 ml of local anaesthetic is injected here. Through the same skin wheal, the needle is introduced laterally, parallel to and above the inguinal ligament around the anticipated line of incision, with around 5 ml of local anaesthetic. Through the same skin wheal, the needle is introduced towards the umbilicus and around 10 ml of local anaesthetic is injected subcutaneously.

5 ml of local anaesthetic is kept which can be used intraoperatively by the surgeon. Once the spermatic cord is exposed, if there is any traction pain, around 5 ml of local anaesthetic is injected under direct vision at the deep inguinal ring by the surgeon to anaesthetize the genitofemoral nerve and sympathetic fibres around the cord.

★ Sensory block is assessed by ether-soaked cotton at the operative site.

★ Analgesic failure is managed with general anaesthesia and these patients are excluded from the study.

★ Intraoperatively, patients receive supplemental oxygen, midazolam, and intravenous fluids.

★ Heart Rate, NIBP, O2 Saturation, Sedation Score are measured every 5 mins till the end of the procedure.

Procedure for Group G - General Anaesthesia

★ Premedication - Glycopyrrolate 0.2 mg iv

Fentanyl 2 micrograms/kg iv

★ Induction - Preservative-free lignocaine 1.5 mg/kg iv

Propofol 3 mg/kg iv

★ Insertion of 4 Size Classical LMA

★ Maintenance - $N_2O : O_2 = 66 : 33$

Sevoflurane 0.5 to 2 %

Intravenous fluids

★ HR, NIBP, O_2 Saturation are recorded every 5 mins till the end of the procedure

★ LMA is removed after patient is fully awake

Post-operative Analgesia:

★ Both the groups receive uniform analgesia – Tablet Diclofenac Sodium 50 mg bd.

★ Rescue analgesia – In case patient complains of pain or the score in the Visual Analog Score is in the moderate range, Injection Pentazocine 0.6 mg/kg.

Parameters that are compared:

★ Intra-operative events like HR, NIBP, O2 Saturation.

★ Recovery time based on Modified Aldrete Score

★ Post-op pain scores based on Visual Analog Scale at 6 hours at rest and during movement and at 24 hours at rest and during movement.

★ Patient satisfaction with the mode of anaesthesia asked at 24hours rated as poor, average, good, excellent.

★ Post-op side effects like nausea, vomiting, backache, headache, pruritis, sore throat, urinary retention, wound infection, wound hematoma.

VISUAL ANALOG SCALE

UNIVERSAL PAIN ASSESSMENT TOOL

This pain assessment tool is intended to help patient care providers assess pain according to individual patient needs. Explain and use 0-10 Scale for patient self-assessment. Use the faces or behavioral observations to interpret expressed pain when patient cannot communicate his/her pain intensity.

	0	2	4	6	8	10
Verbal Descriptor Scale	NO PAIN	MILD PAIN	MODERATE PAIN	MODERATE PAIN	SEVERE PAIN	WORST PAIN POSSIBLE
WONG-BAKER FACIAL GRIMACE SCALE	 Alert Smiling	 No humor serious flat	 Furrowed brow pursed lips breath holding	 Wrinkled nose raised upper lips rapid breathing	 Slow blink open mouth	 Eyes closed moaning crying
ACTIVITY TOLERANCE SCALE	NO PAIN	CAN BE IGNORED	INTERFERES WITH TASKS	INTERFERES WITH CONCENTRATION	INTERFERES WITH BASIC NEEDS	BEDREST REQUIRED
SPANISH	NADA DE DOLOR	UNPOQUITO DE DOLOR	UN DOLOR LEVE	DOLOR FUERTE	DOLOR DEMASIADO FUERTE	UN DOLOR INSOPORTABLE
TAGALOG	Walang Sakit	Konting Sakit	Katamtamang Sakit	Matinding Sakit	Pinaka-Matinding Sakit	Pinaka-Malalang Sakit
CHINESE	不痛	輕微	中度	嚴重	非常嚴重	最嚴重
KOREAN	통증 없음	약한 통증	보통 통증	심한 통증	아주 심한 통증	최악의 통증
PERSIAN (FARSI)	بدون درد	درد ملایم	درد معتدل	درد شدید	درد بسیار شدید	بدترین درد ممکن
VIETNAMESE	Không Đau	Đau Nhẹ	Đau Vừa Phải	Đau Nặng	Đau Thật Nặng	Đau Đớn Tận Cùng
JAPANESE	痛みがない	少し痛い	いくらか痛い	かなり痛い	ひどく痛い	ものすごく痛い

RAMSAY SEDATION SCORE

1. Patient is agitated and anxious or restless, or both

2. Patient is co-operative, oriented and tranquil

3. Patient responds to commands only

4. Patient exhibits brisk response to light glabellar tap or loud auditory stimulus

5. Patient exhibits sluggish response to light glabellar tap or loud auditory stimulus

6 Patient exhibits no response

MODIFIED ALDRETE SCORING SYSTEM

Activity: able to move, voluntarily or on command

2 - Four extremities

1 - Two extremities

0 - No extremities

Respiration

2 - Able to breathe deeply and cough freely

1 - Dyspnea, shallow or limited breathing

0 - Apnea

Circulation

2 - Blood pressure within 20 mm Hg of preoperative level

1 - Blood pressure within 20 – 50 mm Hg of preoperative level

0 - Blood pressure + or – of preoperative level

Consciousness

2 - Fully awake

1 - Arousable on calling

0 - Unresponsive

Oxygen saturation

2 - Saturation > 92%

1 - Needs oxygen to maintain saturation > 90%

0 - Saturation < 90% with oxygen

STATISTICS

Statistical methods used

The descriptive statistics of the variables studied are represented as two-way tables. The categorical factors are represented by the number and frequency (%) of cases. The continuous variables are represented by measures of central frequency (like mean, median & mode) and deviation (standard deviation and range). The differences in the proportions are tested for statistical significance using non-parametric Chi-square test for variables measured on nominal scale. Fisher's exact probability test was employed wherever required. For variables measured on a continuous scale, when testing for two groups, Student "t" test is used to test for statistical significance in the differences of the two means.

TABLE - 1

Distribution of cases by patient satisfaction and group

Subjective rating of patient satisfaction	Group G (n=20)		Group L (n=20)		p-value
	No.	%	No.	%	
Good	6	30.0	13	65.0	0.03
Others	14	70.0	7	30.0	

The frequency of cases whose subjective rating of satisfaction as "Good" was more among Group L than Group G and the difference was statistically significant (p=0.03).

TABLE - 2

Distribution of cases by rescue analgesia and group

Rescue analgesia	Group G (n=20)		Group L(n=20)		Total	
	No.	%	No.	%	No.	p-value
Category 1	11	78.6	3	21.4	14	0.05
Category 2	4	66.7	2	33.3	6	N.S

Among the rescue analgesia category coded as 1 (n=14), the distribution of the number of cases was more among Group G (79%) than Group L (21%) and the difference was statistically significant (p=0.05). Among the rescue analgesia category coded as 2 (n=6), the distribution of the number of cases was more among Group G (67%) than Group L (33%). However, the difference was statistically not significant.

TABLE – 3

Distribution of cases by post OP side-effects and group

Complications	Group G (n=20)		Group L (n=20)		p-value
	No.	%	No.	%	
Nil	15	75.0	18	90.0	
Headache only	0	0.0	1	5.0	
Sore throat only	1	5.0	0	0.0	N.S
Nausea+Vomiting	3	15.0	0	0.0	
Nausea+Vomiting+S	1	5.0	0	0.0	
Pruritis	0	0.0	1	5.0	

The distribution of the number of cases reporting no post-OP side-effects was more among Group L (90%) than Group G (75%). However, the difference was not statistically significant.

TABLE - 4

Distribution of cases by post-OP pain assessment at 6-hours

Post OP pain assessment category: at 6-hours	Group G (n=20)		Group L (n=20)		p-value
	No.	%	No.	%	
At rest					
2	2	10.0	16	80.0	<0.001
3	15	75.0	4	20.0	
4	3	15.0	0	0.0	
At movement					
2	1	5.0	9	45.0	
3	5	25.0	9	45.0	0.001
4	12	60.0	2	10.0	
5	2	10.0	0	0.0	

The differences in the frequency of cases by post-OP pain assessment category at 6-hours between Group G and Group L were statistically significant at rest ($p<0.001$) and at movement ($p=0.001$).

TABLE - 5

Distribution of cases by post-OP pain assessment at 24-hours

Post OP pain assessment category: at 24-hours	Group G (n=20)		Group L (n=20)		p-value
	No.	%	No.	%	
At rest					
2	1	5.0	4	20.0	
3	13	65.0	15	75.0	0.06
4	6	30.0	1	5.0	
At movement					
2	1	5.0	3	15.0	
3	12	60.0	15	75.0	0.13
4	7	35.0	2	10.0	

The differences in the frequency of cases by post-OP pain assessment category at 24-hours between Group G and Group L were statistically not significant at rest (p=0.06) and at movement (p=0.13).

TABLE - 6

Distribution of recovery time of cases by groups

Age	Group G	Group L	p-value
No. of cases	20	20	
Mean	5.6	1.4	
S.D.	1.28	0.59	<0.001
Median	5.5	1	
Range	3 – 8	1 - 1	

The mean recovery time was observed to be lesser in Group L than Group G, the difference being statistically significant ($p<0.001$).

TABLE – 7

Distribution of values by groups and MAP values

MAP at different times	Group G *(n=20)*	Group L *(n=20)*	p-value

0- min			
Mean	92.4	93.3	0.71
SD	7.99	7.03	
5- min			
Mean	91.3	92.1	0.54
SD	8.59	7.65	
10- min			
Mean	89.2	91.6	0.33
SD	7.64	7.69	
15-min			
Mean	89.1	90.9	0.41
SD	7.21	6.28	
20-min			
Mean	88.2	89.8	0.48
SD	7.37	6.90	
25-min			
Mean	88.2	90.1	0.42
SD	7.28	6.65	
30-min			
Mean	88.0	90.7	0.24
SD	7.75	6.60	

The mean MAP values were generally higher among Group L than Group G at all the time points studied. However, the differences were not statistically significant. The trend of mean values of MAP with increasing

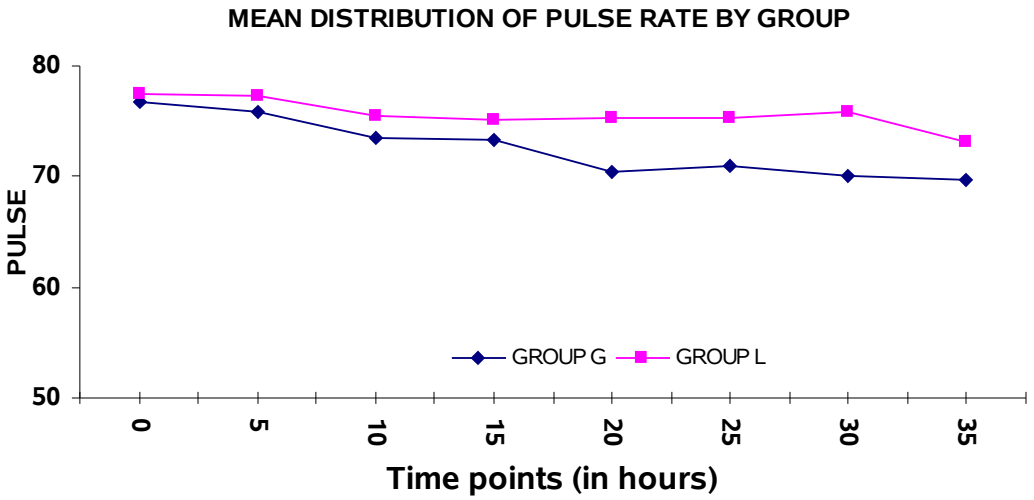
time points was generally decreasing with a tendency to taper off at the end.

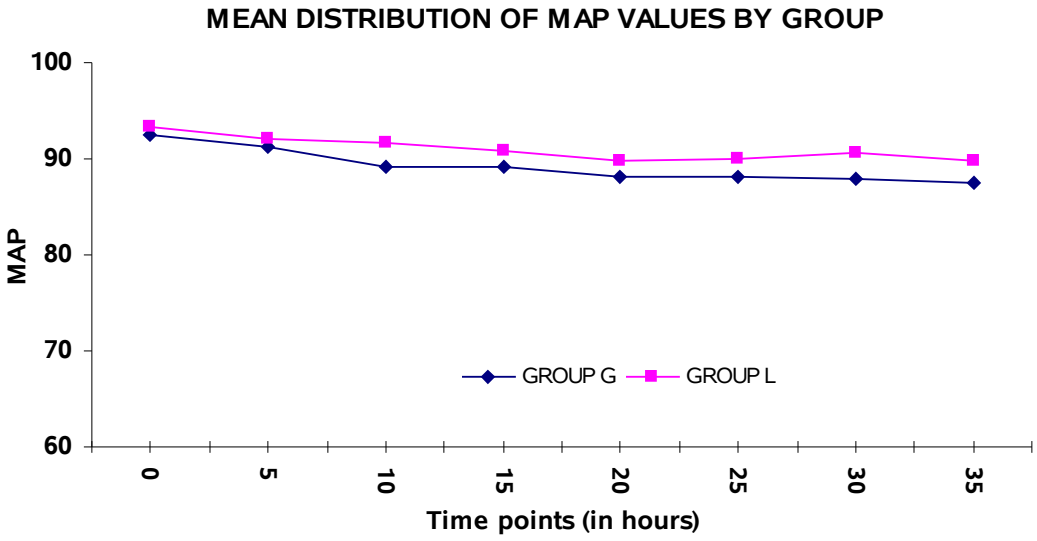
TABLE - 8

Distribution of values by groups and pulse values

MAP	**Group G** ***(n=20)***	**Group L** ***(n=20)***	**p-value**
0- min			
Mean	76.7	77.5	0.71
SD	6.52	6.96	
5- min			
Mean	75.8	77.2	0.49
SD	6.68	5.96	
10- min			
Mean	73.5	75.4	0.36
SD	6.15	6.74	
15-min			
Mean	73.4	75.1	0.37
SD	5.70	6.03	
20-min			
Mean	70.4	75.3	0.002*
SD	4.24	5.21	
25-min			
Mean	70.9	75.3	0.01*
SD	4.83	5.74	
30-min			
Mean	70.0	75.8	0.003*
SD	4.86	6.65	
35-min			
Mean	69.7	73.2	0.02*
SD	4.56	4.41	

The mean values were generally higher among Group L than Group G at all the time points studied. However, the differences were statistically significant only from 20 minutes and later and not at the rest of the time points studied. The trend of mean values of pulse rate with increasing time points was generally decreasing with minor fluctuations among both groups.


MEAN DISTRIBUTION OF PULSE RATE BY GROUP
80
70
60
50
PULSE
GROUP G
GROUP L
0
5
10
15
20
25
30
35
Time points (in hours)


MEAN DISTRIBUTION OF MAP VALUES BY GROUP
100
90
80
70
60
MAP
GROUP G
GROUP L
0
5
10
15
20
25
30
35
Time points (in hours)

DISCUSSION

The observations and results show a clear benefit from local anaesthesia for inguinal hernia repair.

Local anaesthesia provides the following advantages

- Good patient satisfaction
- No major hemodynamic changes in the intra-op period
- Quicker recovery time
- Lower pain scores in the immediate post-op period, upto 6 hours
- Less post-op opioid requirements, so better pain relief
- No major post-op side effects

General anaesthesia has the following main disadvantages

- Prolonged recovery time
- Decreased duration of post-op pain relief
- Increased post-op opioid requirements as rescue analgesia

SUMMARY

This study was conducted in unilateral inguinal hernia repairs as a comparative, randomized, prospective study between local anaesthesia and general anaesthesia. Taking into account inclusion criteria and exclusion criteria, the patients were randomly divided into local anaesthesia and general anaesthesia groups. The procedures for each group was meticulously followed and the patients followed up for 24 hours. The parameters that were compared in the study were noted down for each patient and the results computed using relevant statistical tests.

CONCLUSION

Based on the parameters compared and the statistical analysis results, it is seen that inguinal hernia repair under local anaesthesia is better because it provides better recovery, better post-op pain relief and good patient satisfaction.

The conclusions from this study is inguinal hernia repair done under local anaesthesia with ilio-inguinal, iliohypogastric nerve blocks with field block is a very effective and attractive alternative to general anaesthesia.

PROFORMA

Name :

Age :

Sex :

Height :

Weight :

ASA :

Study Group :

Hospital No. :

Date :

Diagnosis :

Operative procedure :

General Examination

GC :

CVS :

RS :

PR :

BP :

Airway – MPC :

Mouth opening :

Neck movements :

Routine Investigations

Hb PCV

Blood – Urea Sugar

Serum – Creatinine Electrolytes

Intra-op Events

TIME	PR	MAP	SpO2	Ramsay Score
0 min				
5 min				
10 min				
15 min				
20 min				
25 min				
30 min				
35 min				
40 min				
45 min				
50 min				
55 min				
60 min				

Recovery Time (Based on Modified Aldrete Score)

Time for Score of greater than or equal to 9

Post-op Pain Scores (Based on Visual Analog Scale

At 6 hours – Rest

Movement

At 24 hours – Rest

Movement

Patient Satisfaction

Poor

Average

Good

Excellent

Post-op Side Effects

★ Nausea

★ Vomiting

★ Headache

★ Pruritis

★ Sore throat

★ Urinary retention

★ Wound infection

★ Wound hematoma

MASTER CHART
GROUP L – LOCAL ANAESTHESIA

S.No.	Parameters	0	5	10	15	20	25	30	35	40	45	50	55	60
1	Pulse MAP RSS	80 93 2	76 90 2	75 90 3	75 88 3	76 90 3	75 88 3	75 90 3	76 88 2	70 88 2	76 94 2			
2	Pulse MAP RSS	84 84 2	76 85 2	68 84 2	70 86 2	72 80 3	80 82 2	76 80 3	72 84 2	80 83 2	78 85 2			
3	Pulse MAP RSS	74 100 2	76 98 2	67 98 2	67\ 98 2	69 94 2	72 94 2	70 96 3	69 94 3	76 98 2	72 94 2	72 98 2	76 102 2	76 101 2
4	Pulse MAP RSS	77 98 2	86 102 2	78 98 3	72 97 3	80 97 3	72 98 3	90 104 3	72 94 2	76 94 2	75 96 2	76 96 2	75 98 2	
5	Pulse MAP RSS	70 93 2	72 92 2	70 90 3	68 93 3	72 90 3	72 86 3	76 90 2	72 86 2	72 88 2				
6	Pulse MAP RSS	86 100 2	80 100 2	70 96 2	72 92 3	76 96 3	70 100 3	72 92 3	68 96 3	72 92 2	72 94 2	76 92 2		
7	Pulse MAP RSS	86 83 2	86 83 2	92 80 3	90 81 3	84 75 3	86 77 3	90 81 3	86 80 3					
8	Pulse MAP RSS	70 107 2	76 106 2	82 106 2	76 100 3	72 94 3	66 94 3	78 96 3	72 102 3	76 106 2	72 102 2	70 102 2		
9	Pulse MAP RSS	86 99 2	86 102 2	82 104 2	78 98 3	82 99 3	82 98 3	80 99 3	78 98 2	78 98 2	80 98 2			
10	Pulse MAP RSS	70 89 2	76 80 2	78 84 2	78 84 2	76 84 3	76 84 3	76 84 2	78 86 2	70 86 2	76 84 2	76 84 2		
11	Pulse MAP RSS	76 88 2	76 88 2	70 88 2	70 86 2	72 86 3	72 85 3	72 86 2	72 86 2	72 86 2				
12	Pulse MAP RSS	78 86 2	78 89 2	78 90 2	76 86 3	76 86 3	76 86 3	72 86 3	70 86 3	76 88 2	78 88 2	76 88 2		

13	Pulse MAP RSS	72 86 2	72 86 2	70 80 2	72 82 2	70 84 3	70 84 3	66 84 2	70 80 3	72 86 2	70 86 3	70 86 3	72 85 3	

14	Pulse MAP RSS	72 97 2	72 97 2	76 96 2	80 97 2	72 95 2	76 96 2	76 96 2	76 95 2	72 97 2	76 95 2	72 97 2	76 95 2	70 96 2
15	Pulse MAP RSS	76 93 2	76 90 2	72 90 2	70 92 2	72 92 3	76 90 3	72 90 3	72 92 2	72 90 2	76 90 2	76 90 2	72 92 2	
16	Pulse MAP RSS	78 93 2	78 93 2	76 90 2	70 90 3	72 91 3	76 91 2	72 92 2	76 91 2	78 91 2	78 91 2	76 92 2	76 91 2	
17	Pulse MAP RSS	94 105 2	90 105 2	88 102 2	88 101 2	90 102 2	90 101 3	88 100 3	76 98 3	76 98 3	76 98 2	80 99 2	76 78 2	
18	Pulse MAP RSS	78 89 2	76 89 2	76 88 2	78 85 2	76 85 2	76 86 2	70 86 3	72 86 3	72 85 2	76 86 3	76 86 2		
19	Pulse MAP RSS	76 98 2	70 98 2	72 96 2	76 95 2	76 94 3	72 95 3	72 95 3	72 95 3	76 95 3	76 95 3	74 95 3	75 93 3	
20	Pulse MAP RSS	66 85 2	66 85 2	68 82 2	76 86 3	72 82 3	70 86 3	72 86 3	66 76 2	66 80 2	68 95 2	60 85 2		

S.No.	Recovery Time In mins	Postop Pain Scores At 6 hours		Postop Pain Scores At 24 hours		Patient Satisfaction	Rescue Analgesia Iv Pentazocine (0.6 mg/kg) No of times	Postop Side Effects
		Rest	Movement	Rest	Movement			
1	1	2	2	3	3	Good		Nil
2	2	2	4	2	2	Average	1	Nil
3	1	3	3	3	3	Average		Nil
4	1	2	2	2	2	Average		Nil
5	1	2	2	3	3	Good	2	Pruritis
6	1	2	2	3	3	Good		Nil
7	3	2	2	2	2	Good		Nil
8	1	2	3	3	3	Average		Nil
9	2	2	2	3	3	Average		Nil
10	1	2	3	3	4	Good	1	Nil
11	1	2	3	3	3	Good		Nil
12	1	2	3	2	3	Good		Nil
13	1	3	3	4	4	Poor	2	Nil
14	2	2	2	3	3	Good		Nil
15	2	3	3	3	3	Average		Nil
16	1	2	2	3	3	Good		Headache
17	1	2	4	3	3	Good	1	Nil
18	2	3	3	3	3	Good		Nil
19	2	2	3	3	3	Average		Nil
20	1	2	2	3	3	Good		Nil

GROUP G – GENERAL ANAESTHESIA

S.No.	Parameters	0	5	10	15	20	25	30	35	40	45	50	55	60
1	Pulse MAP	85 88	74 88	74 84	72 82	76 82	82 84	76 84	72 83	72 84	76 84	76 84		
2	Pulse MAP	82 86	80 88	76 84	76 83	72 83	70 83	72 84	72 84	70 80	70 83	72 82	72 83	76 84
3	Pulse MAP	68 86	66 84	72 82	68 84	70 82	76 86	70 82	68 80	72 82	70 84	68 84		
4	Pulse MAP	70 99	78 102	82 102	78 99	70 98	70 98	66 102	68 99	70 98	72 98	72 98	70 98	
5	Pulse MAP	90 107	90 107	82 104	82 102	80 102	80 102	78 104	80 102	80 102				
6	Pulse MAP	78 87	76 87	70 85	72 85	66 84	70 85	68 85	70 84	72 84	70 84	70 84		
7	Pulse MAP	80 90	76 88	70 90	72 92	70 88	68 86	70 85	72 84	70 85	70 85	66 84	70 85	
8	Pulse MAP	84 107	86 106	78 96	76 95	76 96	76 96	78 95	76 96	70 95	76 95	76 96	78 98	
9	Pulse MAP	70 108	68 106	70 104	78 104	66 104	68 104	70 104	70 102	70 102	70 104			
10	Pulse MAP	84 96	84 96	72 90	76 88	72 90	72 90	72 88	74 88	74 90	72 88	72 90	74 90	
11	Pulse MAP	72 93	72 93	70 90	70 92	72 93	70 90	68 90	68 90	68 88	72 90	70 90		
12	Pulse MAP	80 93	78 88	80 86	76 86	72 86	72 86	72 86	72 86	76 86	76 86			
13	Pulse MAP	78 89	76 89	76 86	72 84	70 84	66 84	66 84	66 84	68 84	70 86	70 86		
14	Pulse MAP	78 90	76 90	70 88	66 90	66 88	68 92	66 86	66 86	68 86	66 85	66 85		
15	Pulse MAP	70 90	78 86	86 92	86 92	70 86	74 86	74 86	72 85	72 86	74 86	74 86	72 85	70 92
16	Pulse MAP	66 81	60 81	58 82	60 81	60 80	62 80	60 78	60 80	62 78				
17	Pulse MAP	70 80	72 79	70 79	70 80	70 78	66 76	62 78	62 76	62 76	66 76	60 76		
18	Pulse	74	74	74	72	72	72	74	70	70	70	72	74	

	MAP	90	90	82	84	84	83	83	84	83	84	84	83	
19	Pulse MAP	76 90	76 80	70 82	76 82	70 82	68 82	66 83	66 83	66 84	68 86			
20	Pulse MAP	78 98	76 98	70 96	70 96	68 94	68 92	72 92	70 92	70 93	70 93	72 94	70 94	

S.No.	Recovery Time In mins	Postop Pain Scores At 6 hours		Postop Pain Scores At 24 hours		Patient Satisfaction	Rescue Analgesia Iv Pentazocine (0.6 mg/kg) No of times	Postop Side Effects
		Rest	Movement	Rest	Movement			
1	4	3	4	3	3	Average		Nil
2	8	3	4	3	3	Good	1	Nausea Vomiting
3	7	4	4	3	4	Poor	1	Nausea Vomiting Sore throat
4	5	3	4	3	3	Average		Nil
5	6	4	4	3	3	Average	2	Nausea Vomiting
6	5	2	3	2	2	Excellent		Nil
7	7	3	4	3	3	Good		Nil
8	6	4	4	3	3	Average		Nil
9	6	3	3	3	3	Average	2	Nil
10	5	3	4	4	4	Average	1	Nil
11	7	3	3	4	4	Average	2	Nil
12	3	3	3	3	3	Good		Nil
13	5	3	4	3	3	Average		Nil
14	4	2	2	3	3	Average	1	Nil
15	5	3	4	3	3	Good		Nil
16	6	3	4	4	4	Good		Nil
17	5	3	5	4	4	Average	1	Nausea Vomiting
18	4	3	4	4	4	Average	1	Sore Throat
19	7	3	5	4	4	Average	2	Nil
20	6	3	3	3	3	Good	1	Nil

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